

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Keun-Kyu SONG )  
 ) Group Art Unit:  
Serial No.: 10/538,511 ) 2812  
 )  
Filed: June 9, 2005 ) Examiner:  
 ) ULLAH, Elias  
For: STRIPPING COMPOSITION FOR REMOVING )  
PHOTORESIST AND METHOD OF )  
MANUFACTURING TFT SUBSTRATE FOR A )  
LIQUIDCRYSTAL DISPLAY DEVICE USING )  
THE SAME )

**MAIL STOP AF**

Commissioner for Patents  
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**PRE-APPEAL BRIEF REQUEST FOR REVIEW**

In response to the Final Office action mailed May 28, 2009, and in conjunction with the Notice of Appeal filed concurrently herewith, Applicants submit the following remarks in support of the Pre-Appeal Brief Request for Review:

**REMARKS**

The present submission is responsive to the Final Office action of May 28, 2009, referred to herein as “the 5/28/09 FOA”, in which Claims **4**, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, **16**, **17**, and **18** are presently pending (where the independent claims are noted in boldface/underline), where Claims **1**, 2, and 3 are withdrawn from consideration, and Claim 10 is canceled. Further, Applicants gratefully acknowledge that the Examiner has allowed Claims **16**, **17**, and **18**. Therefore, Applicants respectfully request reconsideration in this Pre-Appeal Brief Request of Claims **4**, 5, 6, 7, 8, 9, 11, 12, 13, 14, and 15 only. The Response to the November 18, 2008 Office Action (“the 11/18/09 OA”) filed February 18, 2009 is herein “the 2/18/09 Response”.

In the 5/28/09 FOA, Claims 4-9 are rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,699,330 (“Muraoka”) in view of U.S. Patent No. 6,982,006 (“Boyers”). Applicants respectfully assert error in the Examiner’s rejection of instant Claims 4

and 5-6, for not supporting a *prima facie* case of obviousness on grounds that the Examiner erred 1.) in finding a suggestion for modifying Muraoka with the disclosed pH of 4.2 in Boyers, which in fact teaches the opposite, and 2.) in misapplying the factual disclosure of Muraoka to the claimed element of removing photoresist *using ozone in bubble form* as claimed in Claim 4.

Applicants therefore assert error on the above points as follows.

1.) Finding a suggestion for modifying Muraoka with the disclosed pH of 4.2 in Boyers, which in fact teaches the opposite. Claim 4 claims a pH of 1.6 to 5. In an exemplary embodiment, the acetic acid used in the stripping composition of the instant invention has a pH of 2. See Specification, p. 14, lines 5-6. Boyers discloses that the optimum pH for minimizing metal corrosion is slightly less than 7, and that normalized etch rate for a positive photoresist at pH of 4.2 is about one-tenth of the etch rate obtained at higher pH of 6-7. Boyers, Col. 18, lines 4-18. The Examiner states as reasoning for modifying Muraoka with a pH of 4.2 of Boyer, that a pH of 1.6 to 5 would be obvious because “pH can influence metal corrosion rates and etching rate and pH adjusting chemicals can influence metal corrosion rates and etching rate”. 5/28/09 FOA, p. 3, lines 5-12. In the 5/28/09 FOA, the Examiner appears to agree with Applicants prior arguments in the 2/18/09 Response (p. 10, first full paragraph) that a pH of 6.7 or 7 would be expected to provide an increased etch rate; but notwithstanding, the Examiner would combine the less desired pH of 4.2, disclosed in Boyers as having one-tenth the etch rate than at pH 6-7, which narrowly includes the “optimum value of pH 6.7” for metal etch, stating that “it is not necessary in order to establish a *prima facie* case of obviousness because a suggestion or expectation from the prior art that the claimed invention will have the same or a similar utility as one newly discovered by the applicant.” 5/28/09 FOA, p. 7, lines 10-17. Applicants consider this to be error.

The Examiner’s reasoning appears to contradict common sense, as it suggests modifying Muraoka with a pH of 4.2, over the optimal higher pH of 6-7 as positively taught in Boyer; and that the practitioner would thus disregard the teachings of Boyer to use a less than optimum pH of 4.2 with low photoresist etch rate, over an optimum pH value for low metal etch of pH 6.7. In this way, the Examiner has disregarded the positive teachings of Boyer, in favor of a negative teaching that appears included only to support the Examiner’s position but which has no basis in the teachings of Boyer, and so the Examiner has not provided a suggestion that would lead the skilled practitioner to modify Muraoka to have a pH of between 1.6 and 5 as claimed in Claim 4.

2.) Misapplication of the factual disclosure of Muraoka to the claimed element of removing photoresist using ozone in bubble form as claimed in Claim 4. Muraoka discloses a method of stripping organic compounds using a stripping composition of an organic solvent with a partition coefficient of 0.6 toward ozone, where the ozone is *dissolved* in the solvent. Col. 4, lines 6-12; emphasis added. Muraoka teaches that the ozone concentration may be 100 ppm or higher in the stripping solution, and discloses ozone values of 280 ppm and 220 ppm for acetic acid stripping solutions which decreases with decrease in acetic acid concentration. Muraoka, Col. 6, lines 33-37; FIG. 6. Muraoka teaches bubbling ozone through glass filter into the solution to reach a concentration close to saturation, “up to nearly 400 ppm”. Col. 7, 24-27.

Boyers discloses a *supersaturated* aqueous *solution* of ozone in water for use as a stripping composition. Boyers, e.g., Col. 22, lines 32-36. The maximum concentration of ozone in the saturated water solution at 5°C at 4 bars pressure is 436 mg/L (i.e., 436 ppm per unit weight). Col. 6, lines 29-45; Table 1. Boyer discloses that supersaturation is maintained by dispensing immediately after heating *so that the solution does not have time to equilibrate and release the dissolved ozone*; the method of Boyers involves delivery of a saturated aqueous ozone solution to a surface via dispense through a point-of-use heater to provide the stripping solution at a higher temperature of about 50°C (i.e., a *supersaturated* solution) to provide greater stripping capability (by the higher temperature and higher ozone concentration); by keeping the time interval between heating and contact of the saturated ozone solution with the surface to be treated as short as possible (e.g., about 2 seconds), the solution has minimal time to equilibrate and loses only 10-20% of the ozone during dispense. Col. 13, line 51 to Col. 14, line 32.

Both Muraoka and Boyer clearly and amply disclose use of *saturated* or *supersaturated* solutions, i.e., having fully dissolved ozone (which one will appreciate means not in bubble form) applied to the wafers during the stripping process. In the 5/28/09 FOA, p. 8, lines 13-15, the Examiner states that “Muraoka clearly teaches “ozone in bubble form” see col. 16, lines 45+.” The Examiner has not correctly applied this disclosure of Muraoka to Claim 4, as Muraoka describes *forming* the stripping solution (a step which corresponds to Applicants’ Claim 5, not Claim 4, *which claims the step of using the ozone bubble solution*), and thus Muraoka does not disclose the element of removing photoresist with a stripping solution containing ozone in bubble form as recited in Claim 4.

As noted in the 2/18/09 response, each reference is amply clear that the solution containing ozone has the ozone present in a saturated (Muraoka) or supersaturated (Boyer) form, each of which by definition therefore does not include bubbles. While Muraoka's process operates at ambient pressure and maintains ozone concentration near the saturation limit of about 400 ppm for an acetic acid/solvent solution (where the solvent is expressly non-aqueous), Boyer discloses that supersaturation is maintained by dispensing immediately after heating so that the solution does not have time to equilibrate and form bubbles to release the dissolved ozone. Claim 4 expressly uses a solution with bubbles of ozone therein. "A *prima facie* case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997). The cited art discloses that a method of removal of photoresist from the surface to be stripped is accomplished by a saturated or supersaturated ozone solution (Muraoka and Boyers), but is accomplished as claimed in Applicants instant Claim 4 by a stripping composition including an acetic acid and an ozone gas included in the acetic acid *in the form of a bubble*. Muraoka and Boyers therefore disclose different stripping solutions and methods with different principles of operation, and therefore are materially different from the method of Claim 4; and, as Muraoka and Boyers do not disclose all elements of Claim 4, a *prima facie* case of obviousness cannot be maintained.

Furthermore, the Examiner states in the 5/28/09 FOA that differences in concentration or temperature will not support the patentability of subject matter *encompassed by the prior art* unless there is evidence that it is critical. 5/28/09 FOA, p. 9, lines 1-3, *emphasis added*. As noted previously, Applicants emphasized unexpected results in the 2/18/09 Response on pp. 14-15, bridging paragraph, in which Applicants observed a stripping rate of 6µm/min (for the inventive composition) and that "the stripping rate of the stripping composition of the invention is greatly superior to that of the stripping composition including ozone and the ultra pure water", which Applicants note is essentially the composition of Boyers, and hence, there is evidence in Applicant's instant Specification to show that the results achieved in the method of Claim 4 is unexpected over the stripping composition of a close comparative example, i.e., Boyers. The Applicants respectfully maintain therefore, that the unexpected stripping rate observed by the applicants supports a finding of nonobviousness. The Examiner has asserted, in the 5/28/09 FOA on p. 9, lines 4-6, that "it is not inventive to discover the optimum or workable ranges by routine

experimentation” (citing *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)). The superior results achieved by Applicants in comparison to a comparative method as disclosed in Boyer cannot therefore be mere optimization of parameters found in Muraoka and Boyers, as alleged by the Examiner, but represents the application of a method dramatically different from that disclosed in Muraoka and Boyers. Applicant’s method is not taught in either of these references individually or combined, and hence there is no suggestion or incentive that would lead one skilled in the art to modify the combination of Muraoka and Boyers to provide the stripping composition and method as claimed in instant Claim 4, and maintain the prima facie rejection.

The rejections under 35 U.S.C. § 103(a), of Claims 11 and 12 over Muraoka in view of Boyers, and further in view of U.S. Patent Application Publication No. 2003/0045037 (“Mei”), and of Claims 13-15 over Muraoka in view of Boyers, Mei, and further in view of U.S. Patent Application Publication No. 2002/0088478 (“Degendt”), are traversed based on the above remarks regarding Claim 4, as Mei and Degendt do not remedy the deficiencies of Muraoka and Boyers.

For the above stated reasons, it is respectfully submitted that the final rejection of Claims 4-9 and 11-15, is in error and that the same are allowable over the art of record. The fee set forth in 37 CFR 41.20(b)(1) is enclosed herewith. However, if any fees are due with respect to this submission, please charge them to Deposit Account No. 06-1130 maintained by Applicants’ attorneys. Applicants hereby petition for any necessary extension of time required under 37 C.F.R. 1.136(a) or 1.136(b) which may be required for entry and consideration of this Reply.

Respectfully submitted,

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